

ELECTION/RESTRICTION

Claims 1-21 are pending in this application and are subject to a restriction requirement. A requirement for restriction has been made under 35 U.S.C. §121 (37 C.F.R. §1.142) between the inventions of:

Group I. Claims 1-8, drawn to a sub-genomic viral replicon comprising a nucleic acid construct encoding chimeric HCV nonstructural protein, the NS5B polymerase gene and the NS3 nucleotide sequence that encodes 75 contiguous N-terminal amino acids of the NS3 of genotype 1b of strain BB7, wherein the HCV genotype is 1a from H77 strain.

Group II Claims 9-15, drawn to a sub-genomic viral replicon comprising a nucleic acid construct encoding chimeric HCV nonstructural protein, at least the C-terminal end of a strain specific NS5B polymerase gene and the NS3 nucleotide sequence that encodes 75 contiguous N-terminal amino acids of the NS3 of genotype 1b of strain BB7 wherein the HCV genotype is 1b from J4 strain.

Group III Claim 17, drawn to a method for generating a cell comprising a replicating chimeric subgenomic viral replicon.

Group IV Claims 20 and 21, drawn to a method for screening for compounds that modulate and/or inhibit viral replication.

The Examiner has stated that Claims 16, 18 and 19 are linking claims that join Groups I and II. Accordingly, Restriction between Groups I and II is subject to the non-allowance of the linking claim(s).

The Office Action also required election of one sequence.

REMARKS

Applicants elect the subject matter of Group I without request for rejoinder, and cancel the subject matter of Group II. However, Applicants traverse the Restriction Requirement on the grounds that the basis for the requirement is incorrect.

**THE EXAMINER'S CHARACTERIZATION OF THE CLAIMED
SUBJECT MATTER IS INCORRECT**

Applicants respectfully submit that the description of the groups stated in the Office Action does not accurately reflect the subject matter of the claims. The Office Action's description of the groups incorporates limitations from certain dependent claims that are not found in all of the claims in the group. Applicants wish to clarify for the record that limitations from the dependent claims cannot be read into the claims from which they depend.

**THE CLAIMED SUBJECT MATTER POSSESS A SPECIAL
TECHNICAL FEATURE**

Applicants disagree with the Examiner's allegation that the claims lack a "special technical feature" that defines a contribution over the prior art. Page 4 of the Office Action indicates that the special technical feature is defined as a "sub-genomic viral replicon comprising a nucleic acid construct encoding chimeric HCV nonstructural protein and the NS5B polymerase gene." The Examiner alleges that Hong, et al. (US 2001/0034019) disclose a GBV-B genome in which the non-structural genes have been replaced with HCV non-structural genes. However, the GBV-B genomes disclosed by Hong, et al. are not "sub-genomic viral replicons, as the term is understood in the art, and defined in the instant specification.

A "sub-genomic replicon" is a "viral nucleic acid that contains something less than the full complement of genes and other features of the viral genome, yet is still capable of directing the generation of copies of itself." (Specification, p. 12, second paragraph) The sub-genomic replicons of the subject application are capable of stably replicating in human liver cells (such as the Huh-7 cell line). Hong, et al. appears to disclose two distinguishable types of nucleic acids,

neither of which is a “sub-genomic replicon” capable of directing the generation of copies of itself in human liver cells. The first type of nucleic acid described by Hong, et al. is a “full-length” chimeric construct. A full-length chimeric construct is a construct that includes a full-length “chimeric virus or a nucleic acid encoding the genome of a chimeric virus...” (Hong, et al. Figure 1, and definition p. 4) Such a clone or construct includes the full complement of genes and other features of the viral genome and, therefore, is not a “sub-genomic replicon.” The second type of nucleic acid described by Hong, et al. is a construct that includes at least one nucleic acid from HCV (or GBV-B) that encodes a functional activity of a viral component. Examples of the nucleic acids incorporated into these constructs are provided in Figure 2 of Hong, *et al.* None of these is capable of “directing the generation of copies of itself” in a human liver cell. Rather the constructs described by Hong, et al. are conventional plasmids that include individual genes or not more than two genes, which are capable of replication in bacterial cells (*i.e.*, *E. coli*). One of skill in the art would recognize that these are not within the definition of “sub-genomic replicons” as claimed in the instant application.

Accordingly, Hong, et al. does not disclose the special technical feature shared by the claims of the instant specification. Nonetheless, to expedite prosecution, Applicants elect the subject matter of Group I without request for rejoinder, and cancel the subject matter of Group II. Applicants also hereby submit amendments to the elected claims to more specifically and clearly define the elected subject matter. In view of the election, amendments and cancellation of claims, Applicants believe that the characterization of claims 16, 18 and 19 as linking claims is rendered moot.

THE RESTRICTION IS AN IMPROPER REJECTION OF THE CLAIMS

On page 4, first full paragraph, the Office Action reads:

Further restriction is required to elect one sequence: SEQ ID NO:2, SEQ ID NO:6, SEQ ID NO:7, or SEQ ID NO:8. Each SEQ ID NO:2, SEQ ID NO:6, SEQ ID NO:7, and SEQ ID NO:8 is patentably distinct because each sequence has different nucleic acid content, thus presenting a serious search burden on the Office resources.

To the extent this statement is intended as an ELECTION OF SPECIES, Applicants elect SEQ ID NO:7 for the purpose of initial examination, without traverse. In the event that one or more generic claims are found to be allowable, Applicants respectfully request examination of additional species that are dependent from or otherwise include all of the limitations of the allowable generic claim as required under 37 CFR 1.141.

In the event that the Examiner intends to impose a RESTRICTION REQUIREMENT between the individual exemplary sequences, Applicants traverse the restriction on the grounds that this is an improper application of the guidelines published in the Notice regarding the examination of patent applications containing nucleotide sequence, published March 27, 2007 in the Office Gazette of the USPTO, Vol. 1316, No. 4. The guidelines provide that for National stage applications filed under 35 U.S.C. 371:

[U]nity of invention determination will be made in view of PCT Rule 13.2, 37 CFR 1.475 and Chapter 10 of the ISPE Guidelines. Unity of invention will exist when the polynucleotide molecules, as claimed, share a general inventive concept, *i.e.*, share a technical feature which makes a contribution over the prior art.

As stated above, the claimed nucleic acids, including SEQ ID NOs: 2, 7 and 8, share a special technical feature that makes a contribution over the cited prior art, *i.e.*, Hong, *et al.* Furthermore, the claimed sequences, including SEQ ID NOs: 2, 7 and 8 are highly related nucleic acids, with common structural and functional properties, which share a common utility. Each of the claimed nucleic acids, including SEQ ID NOs: 2, 7 and 8, are chimeric sub-genomic replicons capable of replicating in human liver cells. The claimed nucleic acids encode nonstructural proteins from strains of HCV. Thus, the component nucleic acids (*i.e.*, genes) are orthologues from different strains of HCV, which encode homologous HCV nonstructural proteins. The replicons are greater than 84% identical across their entire length (as shown in the sequence alignment of Appendix I). Based on all of these criteria, the claimed sequences (including exemplary sequences SEQ ID NOs:2, 7, and 8) are not independent and distinct inventions, and therefore may not be restricted for the purpose of examination.

In addition, Applicants traverse this restriction of the claims, because the restriction requirement does not conform to the requirements of 35 U.S.C. §121, as expressly articulated by the C.C.P.A.

As a preliminary matter, alleging that a particular claim represents multiple patentably distinct inventions is a *de facto* rejection of the patentability of the claim, because the claim cannot issue as drafted. As the C.C.P.A. noted (emphasis added):

As a general proposition, an applicant has a right to have each claim examined on the merits. If an applicant submits a number of claims, it may well be that pursuant to a proper restriction requirement, those claims will be dispersed to a number of applications. Such action would not affect the rights of the applicant eventually to have each of the claims examined in the form he considers to best define his invention. If, however, a single claim is required to be divided up and presented in several applications, that claim would never be considered on the merits. The totality of the resulting fragmentary claims would not necessarily be the equivalent of the original claim. Further, since the subgenera would be defined by the examiner, rather than by the applicant, it is not inconceivable that a number of the fragments would not be described in the specification. *See, In Re Weber, Soder and Boksay* 198 USPQ 328, 331 (C.C.P.A. 1978). *See also, In Re Haas* 179 USPQ 623, 624, 625 (*In Re Haas I*) (C.C.P.A. 1973) and *In Re Haas* 198 USPQ 334-337 (*In Re Haas II*) (C.C.P.A. 1978).

It has long been held that an Examiner may not reject a particular claim on the basis that it represents independent and distinct inventions. *See, In Re Weber, Soder and Boksay, supra*. The courts have definitively ruled that the statute authorizing restriction practice, *i.e.*, 35 U.S.C. §121, provides no legal authority to impose a restriction requirement on a single claim, even if the claim presents multiple independently patentable inventions. *See, In Re Weber, Soder and Boksay, In Re Haas I and In Re Haas II, supra*. In the cases set forth above, the courts expressly ruled that there is no statutory basis for rejecting a claim for misjoinder, despite previous attempts by the Patent Office to fashion such a rejection. For example, *In re Weber* (198 USPQ 328) sets forth the following (*see*, 331-332):

It is apparent that §121 provides the commissioner with the authority to promulgate rules designed to restrict an application to one of several claimed inventions when those inventions are found to be "independent and distinct." It does not, however, provide a basis for an examiner, acting under the authority of the commissioner to reject a particular claim on the same basis.

In *re Haas* (198 USPQ 335) interprets this as a *per se* holding, in the very next case by the court:

In *In re Weber*... decided of even date, this court holds that § 121 does not provide a basis for rejection of a claim. To the extent that § 121 was employed as a basis for rejection, that rejection is, on the authority of *Weber*, reversed.

As the Court has also noted:

The discretionary power to limit one applicant to one invention is no excuse at all for refusing to examine a broad generic claim-- no matter how broad, which means no matter how many independently patentable inventions may fall within it. *See, In Re Weber, Soder and Boksay* at 334.

Instead of improperly imposing a restriction requirement on a single claim, the Office may limit initial examination to a reasonable number of species encompassed by the claim. *See*, 37 C.F.R. §1.146. This practice strikes an appropriate balance between the concerns of the Patent Office regarding administrative considerations and unduly burdensome examination, and the clear constitutional and statutory rights of an inventor to claim an invention as it is contemplated, provided the dictates of 35 U.S.C. §112 are complied with. *See*, MPEP § 803.02. *see also, In Re Wolfrum*, 179 USPQ 620 (C.C.P.A. 1973); *In re Kuehl*, 177 U.S.P.Q. 250 (C.C.P.A. 1973). Unlike a restriction requirement, a species election does not preclude an applicant from pursuing the original form of a claim in subsequent prosecution, nor does it force an applicant to file multiple divisional applications which are simply incapable of capturing the scope of the invention.

In light of the case law cited above, Applicants submit that the Office is simply forbidden from restricting a single claim (*i.e.* claims 1-8 and 16) into

multiple groups, because 1) such a restriction is necessarily a rejection of the claim (that is, there is no application where an applicant is permitted to pursue the claim as drafted); and 2) the court has explicitly held that §121 does not provide a basis for such a rejection (and the court has, quite bluntly and unequivocally, held that this is a *per se* holding).

Because the restriction is improper, Applicants respectfully request that any restriction of SEQ ID NOs: 2, 7 and 8 be withdrawn, so that the full scope of the genus (*e.g.*, of claim 1) can be examined on the merits as is the Applicants' right.

Finally, Applicants note that the courts have explicitly held that improper restriction of a single claim is a decision under the jurisdiction of the Board of Appeals, and the Federal Courts. This is in contrast to simple administrative decisions regarding ordinary restriction requirements, which are not generally subject to Appellate review. *See, In Re Haas I, supra*. Because restriction of a single claim into multiple groups is a rejection and a refusal to examine the claim as drafted, as articulated in *Haas I*, the Board of Appeals and the courts have jurisdiction over the decision. Accordingly, Applicants expressly reserve the right to appeal any decision that may be made regarding the present Restriction Requirement to the Patent Office Board of Appeals and to the Federal Circuit, in this or any future related application.

THE CLAIMS DO NOT PRESENT AN UNDUE BURDEN FOR EXAMINATION

Applicants traverse the restriction of the claims as presented in the Office Action mailed 11 May 2007, because co-examination of the claims as suggested above would not present an undue burden for examination. Because the restriction is improper, Applicants respectfully request that the claims be rejoined, as described above. It is respectfully submitted that examination of the full scope of claims 1-8 and 16 presents an appropriate balance between the concerns of the Office regarding undue examination burden and Applicants' right to examination of the claims as drafted.

Restriction of an application is discretionary. A restriction requirement is made to avoid placing an undue examination burden on the Examiner and the

Office. Where claims can be examined together without undue burden, the Examiner *must* examine the claims on the merits even though they are directed to independent and distinct inventions. *See*, MPEP § 803.01. In establishing that an undue burden would exist for co-examination of claims, the Examiner *must* show that examination of the claims would involve substantially different prior art searches, making the co-examination burdensome.

To show undue burden resulting from searching difficulties, the Examiner *must* show one of the following, as set forth in the MPEP at § 808.02:

(1) *Separate classification thereof:*

This shows that each distinct subject has attained recognition in the art as a separate subject for inventive effort, and also a separate field of search. Patents need not be cited to show separate classification.

(2) *A separate status in the art when they are classifiable together:*

Even though they are classified together, each subject can be shown to have formed a separate subject for inventive effort when an explanation indicates a recognition of separate inventive effort by inventors. Separate status in the art may be shown by citing patents which are evidence of such separate status, and also of a separate field of search.

(3) *A different field of search:*

Where it is necessary to search for one of the distinct subjects in places where no pertinent art to the other subject exists, a different field of search is shown, even though the two are classified together. The indicated different field of search must in fact be pertinent to the type of subject matter covered by the claims. Patents need not be cited to show different fields of search.

Where, however, the classification is the same and the field of search is the same and there is no clear indication of separate future classification and field of search, no reasons exist for dividing among related inventions.

See, The MPEP at § 808.02, *emphasis added*.

In insisting upon restriction of the invention, the Examiner *must* establish that each of the groups has established separate status in the art, as evidenced, *e.g.*, by separate classification, separate field of search, or citation of patents establishing separate status in the art. *See*, the MPEP, *id.* This required showing is not optional. It is not sufficient simply to allege that the subject matter “is patentably distinct because each sequence has different nucleic acid content, thus

presenting a serious search burden on the Office resources.” (Office Action, p. 4, first paragraph). On the contrary, in the present case, the same search will necessarily identify prior art relevant to the claimed genus as a whole, as well as to the different sequence encompassed by the genus, including representative sequences SEQ ID NOs: 2, 7 and 8.

In the absence of such a reasoned statement, and given the evidence presented by Applicants demonstrating the similarity and relatedness between the species encompassed by the claimed genus, Applicants respectfully submit that no undue burden of examination exists with respect to the Groups proposed by Applicants, and therefore request that the claims be rejoined as proposed for the purposes of examination.

REQUEST FOR REJOINDER

Applicants also note that the subject matter of Groups I and III are related to each other as product and process for making the product. Similarly the subject matter of Groups I and IV are related to each other as product and process of using the product. When product claims (for example, one or more of claims 1-8 and 16) are found to be allowable, Applicants respectfully request rejoinder of process claims (17 and 20-21) that are dependent or otherwise include all of the limitations of the allowed product claims as required by MPEP §831.04(b).

CONCLUSION

Applicants elect Group I (claims 1-8 and 16) without traverse. Applicants provisionally elect SEQ ID NO:7, with traverse for the purpose of initial examination on the merits. The Applicants reserve the right to prosecute, in one or more patent applications, the canceled claims, the claims to non-elected inventions, the claims as originally filed, and any other claims supported by the specification. If it would expedite prosecution of this application, the Examiner is invited to confer with the Applicants' undersigned agent.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Gwynedd Warren', with a stylized flourish at the end.

Gwynedd Warren
Attorney for Applicant
Registration No. 45,200

GLAXOSMITHKLINE
Corporate Intellectual Property - UW2220
P.O. Box 1539
King of Prussia, PA 19406-0939
Phone (610) 270-7241
Facsimile (610) 270-5090
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1 seven	7983	3 eight	7989	84
2 two	7989	3 eight	7989	90

PLEASE NOTE: Some scores may be missing from the above table if the alignment was done using multiple CPU mode. Please

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Alignment

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CLUSTAL W (1.83) multiple sequence alignment

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two        GCCAGCCCCCGATTGGGGGCGACACTCCACCATAGATCACTCCCCTGTGAGGAACTACTG  60
eight      GCCAGCCCCCGATTGGGGGCGACACTCCACCATAGATCACTCCCCTGTGAGGAACTACTG  60
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two        TCTTCACGCAGAAAGCGTCTAGCCATGGCGTTAGTATGAGTGTCGTGCAGCCTCCAGGAC  120
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two        CCCCCCTCCCGGGAGAGCCATAGTGGTCTGCGGAACCGGTGAGTACACCGGAATTGCCAG 180
eight      CCCCCCTCCCGGGAGAGCCATAGTGGTCTGCGGAACCGGTGAGTACACCGGAATTGCCAG 180
*****

seven      GACGACCGGGTCCTTTCTTGGATCAACCCGCTCAATGCCTGGAGATTGGGCGTGCCCC 240
two        GACGACCGGGTCCTTTCTTGGATCAACCCGCTCAATGCCTGGAGATTGGGCGTGCCCC 240
eight      GACGACCGGGTCCTTTCTTGGATCAACCCGCTCAATGCCTGGAGATTGGGCGTGCCCC 240
*****

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two        GCGAGACTGCTAGCCGAGTAGTGTGGGTGCGGAAAGGCCTTGTGGTACTGCCTGATAGG 300
eight      GCGAGACTGCTAGCCGAGTAGTGTGGGTGCGGAAAGGCCTTGTGGTACTGCCTGATAGG 300
*****

seven      GTGCTTGGAGTGCCCCGGGAGGTCTCGTAGACCGTGCACCATGAGCACGAATCCTAAAC 360
two        GTGCTTGGAGTGCCCCGGGAGGTCTCGTAGACCGTGCACCATGAGCACGAATCCTAAAC 360
eight      GTGCTTGGAGTGCCCCGGGAGGTCTCGTAGACCGTGCACCATGAGCACGAATCCTAAAC 360
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eight      CTCAAAGAAAAACCAAAGGCGCGCCATGATTGAACAAGATGGATTGCACGCAGGTTCTC 420
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eight      CTGATGCCGCCGTGTTCCGGCTGTCAGCGCAGGGGCGCCCGGTTCTTTTGTCAAGACCG 540
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eight      ACCTGTCCGGTGCCCTGAATGAACTGCAGGACGAGGCAGCGCGGCTATCGTGGCTGGCCA 600
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*****

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eight      TGCTATTGGGCGAAGTGCCGGGGCAGGATCTCCTGTCTCTCACCTTGCTCCTGCCGAGA 720
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eight      CATTCGACCACCAAGCGAAACATCGCATCGAGCGAGCACGTACTCGGATGGAAGCCGGTC 840
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two        TTGTCGATCAGGATGATCTGGACGAAGAGCATCAGGGGCTCGCGCCAGCCGAAGTGTTCG 900
eight      TTGTCGATCAGGATGATCTGGACGAAGAGCATCAGGGGCTCGCGCCAGCCGAAGTGTTCG 900
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      eight    *****

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      two      GCTTGCCGAATATCATGGTGGAAAATGGCCGCTTTTCTGGATTTCATCGACTGTGGCCGGC 1020
      eight    GCTTGCCGAATATCATGGTGGAAAATGGCCGCTTTTCTGGATTTCATCGACTGTGGCCGGC 1020
      *****

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two eight	ACCACGGGCGGCTCCATTACGTACTCCACCTATGGCAAGTTCTTGCCGACGGTGGCTGT *****	2640
seven two eight	TCAGGAGGTGCTTATGACATAATAATTTGTGACGAGTGCCACTCCACGGATGCCACATCC TCAGGAGGTGCTTATGACATAATAATTTGTGACGAGTGCCACTCCACGGATGCCACATCC TCTGGGGGCGCCTATGACATCATAATATGTGATGAGTGCCACTCAACTGACTCGACTACC **	2700 2700 2700
seven two eight	ATCTTGGGCATCGGCACTGTCTTGACCAAGCAGAGACTGCGGGGGCGAGACTGGTTGTG ATCTTGGGCATCGGCACTGTCTTGACCAAGCAGAGACTGCGGGGGCGAGACTGGTTGTG ATCTTGGGCATCGGCACAGTCTGGACCAAGCGGAGACGGCTGGAGCGCGGTCGTCTGTG *****	2760 2760 2760
seven two eight	CTCGCCACTGCTACCCCTCCGGGCTCCGTCACTGTGCCCCATCCTAACATCGAGGAGGTT CTCGCCACTGCTACCCCTCCGGGCTCCGTCACTGTGTCCCATCCTAACATCGAGGAGGTT CTCGCCACCGCTACACCTCCGGGATCGTTACCGTGCCACACCCCAATATCGAGGAAATA *****	2820 2820 2820
seven two eight	GCTCTGTCCACCACCGGAGAGATCCCCTTTTACGGCAAGGCTATCCCCCTCGAGGTGATC GCTCTGTCCACCACCGGAGAGATCCCCTTTTACGGCAAGGCTATCCCCCTCGAGGTGATC GGCCTGTCCAACAATGAGAGATCCCCTTCTATGGCAAAGCCATCCCCATTGAGGCCATC * *****	2880 2880 2880
seven two eight	AAGGGGGGAAGACATCTCATCTTCTGCCACTCAAAGAAGAAGTGCGACGAGCTCGCCGCG AAGGGGGGAAGACATCTCATCTTCTGCCACTCAAAGAAGAAGTGCGACGAGCTCGCCGCG AAGGGGGGAGGCATCTCATTTCTGCCATTCCAAGAAGAAATGCGAGCTCGCCGCA *****	2940 2940 2940
seven two eight	AAGCTGGTCGCATTGGGCATCAATGCCGTGGCCTACTACCGCGGTCTTGACGTGTCTGTC AAGCTGGTCGCATTGGGCATCAATGCCGTGGCCTACTACCGCGGTCTTGACGTGTCTGTC AAGCTGACAGGCCTCGACTGAACGCTGTAGCATATTACCGGGGCTTGATGTGTCGCTC *****	3000 3000 3000
seven two eight	ATCCCGACCAGCGGCGATGTTGTGTCGTGTCGACCGATGCTCTCATGACTGGCTTTACC ATCCCGACCAGCGGCGATGTTGTGTCGTGTCGACCGATGCTCTCATGACTGGCTTTACC ATACCGCCTATCGGAGACGTCGTTGTCGTGGCAACAGACGCTCTAATGACGGGTTTACC **	3060 3060 3060
seven two eight	GGCGACTTCGACTCTGTGATAGACTGCAACACGTGTGTCACTCAGACAGTCGATTTACAGC GGCGACTTCGACTCTGTGATAGACTGCAACACGTGTGTCACTCAGACAGTCGATTTACAGC GGCGATTTTGACTCAGTGCAGTGCATATGATGTGTCAACGACAGTCGATTTACAGC *****	3120 3120 3120
seven two eight	CTTGACCCTACCTTTACCATTGAGACAACACGCTCCCCAGGATGCTGTCTCCAGGACT CTTGACCCTACCTTTACCATTGAGACAACACGCTCCCCAGGATGCTGTCTCCAGGACT TTGGATCCCACCTTCACCATTGAGACGACGACCGTGCCCCAAGACGCGGTCTCGCGCTCG * * * *	3180 3180 3180
seven two eight	CAACGCCGGGGCAGGACTGGCAGGGGGAAGCCAGGCATCTATAGATTTGTGGCACCGGGG CAACGCCGGGGCAGGACTGGCAGGGGGAAGCCAGGCATCTATAGATTTGTGGCACCGGGG CAACGCCGAGGTAGAACTGGCAGGGGTAGGAGTGGCATCTACAGGTTTGTGACTCCAGGA *****	3240 3240 3240
seven two eight	GAGCGCCCCTCCGGCATGTTTCGACTCGTCCGTCTCTGTGAGTGCTATGACGCGGGCTGT GAGCGCCCCTCCGGCATGTTTCGACTCGTCCGTCTCTGTGAGTGCTATGACGCGGGCTGT GAACGGCCCCTCCGGCATGTTTCGATTCTTCGGTCTCTGTGTGAGTGCTATGACGCGGGCTGT * * * *	3300 3300 3300
seven two eight	GCTTGGTATGAGCTCACGCCCCGCGAGACTACAGTTAGGCTACGAGCGTACATGAACACC GCTTGGTATGAGCTCACGCCCCGCGAGACTACAGTTAGGCTACGAGCGTACATGAACACC GCTTGGTATGAGCTCACGCCCCGCTGAGACCTCGGTTAGGTTGCGGGCTTACCTAAATACA *****	3360 3360 3360
seven two eight	CCGGGGCTTCCCGTGTGCCAGGACCATCTGAATTTTGGGAGGGCGTCTTTACGGGCCTC CCGGGGCTTCCCGTGTGCCAGGACCATCTGAATTTTGGGAGGGCGTCTTTACGGGCCTC CCAGGGTTGCCCGTCTGCCAGGACCATCTGGAGTTCTGGGAGAGCGTCTTCACAGGCCTC * * * *	3420 3420 3420
seven two	ACTCATATAGATGCCCACTTTTTATCCCAGACAAAGCAGAGTGGGGAGAAGTTTCTTAC ACTCATATAGATGCCCACTTTTTATCCCAGACAAAGCAGAGTGGGGAGAAGTTTCTTAC	3480 3480


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two
eight      AAGGTGCTCGTGGACATCTTGGCGGGCTATGGGGCAGGGGTAGCCGGCGCACTCGTGGCC 4320
*****

seven
two
eight      TTCAAGATCATGAGCGGTGAGGTCCCCTCCACGGAGGACCTGGTCAATCTGCTGCCCGCC 4380
TTCAAGATCATGAGCGGTGAGGTCCCCTCCACGGAGGACCTGGTCAATCTGCTGCCCGCC 4380
TTTAAGGTCTATGAGCGGCGAGGTGCCCTCCACCGAGGACCTGGTCAACTTACTCCCTGCC 4380
** ***

seven
two
eight      ATCCTCTCGCCTGGAGCCCTTGTAGTCGGTGTGGTCTGCGCAGCAATACTGCGCCGGCAC 4440
ATCCTCTCGCCTGGAGCCCTTGTAGTCGGTGTGGTCTGCGCAGCAATACTGCGCCGGCAC 4440
ATCCTCTCTCCTGGTGCCCTGGTGTGCGGGTGTGCTGCGCAGCAATACTGCGTCCGGCAC 4440
*****

seven
two
eight      GTTGGCCCGGGCGAGGGGGCAGTGCAATGGATGAACCGGCTAATAGCCTTCGCCTCCCGG 4500
GTTGGCCCGGGCGAGGGGGCAGTGCAATGGATGAACCGGCTAATAGCCTTCGCCTCCCGG 4500
GTGGGCCCGGGAGAGGGGGCTGTGCAGTGGATGAACCGGCTGATAGCGTTCGTTCCGGG 4500
** *****

seven
two
eight      GGAACCATGTTTCCCCACGCACTACGTGCCGGAGAGCGATGCAGCCGCCCGCGTCACT 4560
GGAACCATGTTTCCCCACGCACTACGTGCCGGAGAGCGATGCAGCCGCCCGCGTCACT 4560
GGTAACCACTCTCCCTACGCACTATGTGCTGAGAGCGACGTGCAGCACGTGTCTACT 4560
** *****

seven
two
eight      GCCATACTCAGCAGCCTCACTGTAACCCAGCTCCTGAGGCGACTGCATCAGTGGATAAGC 4620
GCCATACTCAGCAGCCTCACTGTAACCCAGCTCCTGAGGCGACTGCATCAGTGGATAAGC 4620
CAGATCCTCTCTAGCCTTACCATCACTCAACTGCTGAAGCGGCTCCACCAGTGGATTAAT 4620
** ***

seven
two
eight      TCGGAGTGTACCACTCCATGCTCCGGTTCTTGCTAAGGGACATCTGGGACTGGATATGC 4680
TCGGAGTGTACCACTCCATGCTCCGGTTCTTGCTAAGGGACATCTGGGACTGGATATGC 4680
GAGGACTGCTCTACGCCATGCTCCGGTCTGTGGCTAAGGGATGTTTGGGATTGGATATGC 4680
*** **

seven
two
eight      GTGGTGCTGAGCGACTTTAAGACCTGGCTGAAAGCCAAGCTCATGCCACAACCTGCCTGGG 4740
GAGGTGCTGAGCGACTTTAAGACCTGGCTGAAAGCCAAGCTCATGCCACAACCTGCCTGGG 4740
ACGGTGTTGACTGACTTCAAGACCTGGCTCCAGTCCAACTCCTGCCCGGTTACCGGGA 4740
*****

seven
two
eight      ATTCCCTTTGTGTCTGCTGCCAGCGCGGTATAGGGGGGTCTGGCGAGGAGACGGCATTATG 4800
ATTCCCTTTGTGTCTGCTGCCAGCGCGGTATAGGGGGGTCTGGCGAGGAGACGGCATTATG 4800
GTCCCTTTCTGTCTATGCCAACGCGGTACAAGGGAGTCTGGCGGGGGGACGGCATCATG 4800
* **

seven
two
eight      CACACTCGCTGCCACTGTGGAGCTGAGATCACTGGACATGTCAAAAACGGGACGATGAGG 4860
CACACTCGCTGCCACTGTGGAGCTGAGATCACTGGACATGTCAAAAACGGGACGATGAGG 4860
CAAACCACTGCCCATGCGGAGCACAGATCGCCGACATGTCAAAAACGGTTCCATGAGG 4860
** *

seven
two
eight      ATCGTCGGTCTTAGGACCTGCAGGAACATGTGGAGTGGGACGTTCCCATTAACGCCTAC 4920
ATCGTCGGTCTTAGGACCTGCAGGAACATGTGGAGTGGGACGTTCCCATTAACGCCTAC 4920
ATCGTAGGGCCTAGAACCTGCAGCAACAGTGGCACGGAACGTTCCCATTAACGCCTAC 4920
*****

seven
two
eight      ACCACGGGCCCCCTGTACTCCCCTTCCTGCGCCGAACATAAGTTCGCGCTGTGGAGGGTG 4980
ACCACGGGCCCCCTGTACTCCCCTTCCTGCGCCGAACATAAGTTCGCGCTGTGGAGGGTG 4980
ACCACGGGACCTTGCAACCCCTCCCCGCGCCCAACTATTCCAGGGCGCTATGGCGGGTG 4980
*****

seven
two
eight      TCTGCAGAGGAATACGTGGAGATAAGGCGGGTGGGGGACTTCCACTACGTATCGGGTATG 5040
TCTGCAGAGGAATACGTGGAGATAAGGCGGGTGGGGGACTTCCACTACGTATCGGGTATG 5040
GCTGCTGAGGAGTACGTGGAGTTACGCGTGTGGGGGATTTCCACTACGTACGGGCATG 5040
****

seven
two
eight      ACTACTGACAATCTTAAATGCCCGTGCCAGATCCCATCGCCGAATTCTTCACAGAATTG 5100
ACTACTGACAATCTTAAATGCCCGTGCCAGATCCCATCGCCGAATTCTTCACAGAATTG 5100
ACCACTGACAACGTAAAGTGCCCATGCCAGTTCCGGCCCCGAATTCTTCACGGAGGTG 5100
** *****

seven
two
eight      GACGGGGTGCGCTACACAGGTTTGCGCCCCCTTGCAAGCCCTTGCTGCGGGAGGAGGTA 5160
GATGGGGTGCGGTTGCAACAGGTACGCTCCAGCGTGCAAAACCCCTTCTACGGGAGGAGGTG 5160
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two
eight      TCTACCGTGAAGTGAAGGAGGCTAGT---GAGGATGTGCTGCTGCTCAATGTCTATACG 5997
          ** ** ** **          * **          ** ** * ** * ** * ** * ** *

seven
two
eight      TGGACAGGCGCACTCGTCACCCCGTGCGCTGCGGAAGAACAAAACTGCCCATCAACGCA 6060
          TGGACAGGCGCCCTGATCACGCCATGCGCTGCGGAGGAAACCAAGCTGCCCATCAATGCA 6057
          TGGACAGGCGCCCTGATCACGCCATGCGCTGCGGAGGAAAGTAAGCTGCCCATCAACCG 6057
          ***** ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      CTGAGCAACTCGTTGCTACGCCATCACAATCTGGTGTATTCCACCACTTCACGCAGTGCT 6120
          CTGAGCAACTCTTTGCTCCGTCAACCAACTTGGTCTATGCTACAACATCTCGCAGCGCA 6117
          TTGAGCAACTCTTTGCTGCGTCACCAACAACATGGTCTACGCCACAACATCCCGCAGCGCA 6117
          ***** ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      TGCCAAAGGCAGAAGAAAGTCACATTTGACAGACTGCAAGTTCTGGACAGCCATTACCAG 6180
          AGCCTGCGGCAGAAGAAGGTCACCTTTGACAGACTGCAGGTCCTGGACGACCACTACCG 6177
          AGCCTCCGGCAGAAGAAGGTCACCTTTGACAGATTGCAAGTCTGGATGATCATTACCG 6177
          *** ***** ** * ** * ** * ** * ** * ** *

seven
two
eight      GACGTGCTCAAGGAGGTCAAAGCAGCGCGCTCAAAGTGAAGGCTAACTTGCTATCCGTA 6240
          GACGTGCTCAAGGAGATGAAGGCCAAGGCGTCCACAGTTAAGGCTAACTTCTATCCGTG 6237
          GACGTACTCAAGGAGATGAAGGCCAAGGCGTCCACAGTTAAGGCTAAGCTTCTATCTATA 6237
          ***** ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      GAGGAAGCTTGCGAGCCTGACGCCCCCACATTCAGCCAAATCCAAGTTTGCTATGGGGCA 6300
          GAGGAAGCCTGTAAGCTGACGCCCCCACATTCGGCCAGATCTAAATTTGGCTATGGGGCA 6297
          GAGGAGGCCTGCAAGCTGACGCCCCCACATTCGGCCAAATCCAATTTGGCTATGGGGCA 6297
          ***** ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      AAAGACGTCCGTGTCATGCCAGAAAGGCCGTAGCCACATCAACTCCGTGTGGAAAGAC 6360
          AAGGACGTCCGGAACCTATCCAGCAAGGCCGTTAACCACATCCGCTCCGTGTGGAAAGAC 6357
          AAGGACGTCCGGAACCTATCCAGCAGGGCCGTTAACCACATCCGCTCCGTGTGGGAGGAC 6357
          ** ***** ** * ** * ** * ** * ** * ** *

seven
two
eight      CTTCTGGAAGACAGTGTAACACCAATTGACACTACCATCATGGCCAAGAACGAGGTTTTTC 6420
          TTGCTGGAAGACACTGAGACACCAATTGACACCACCATCATGGCAAAAAATGAGGTTTTTC 6417
          TTGCTGGAAGACACTGAAACACCAATTGACACCACCATCATGGCAAAAAATGAGGTTTTTC 6417
          * ***** ** * ** * ** * ** * ** * ** *

seven
two
eight      TCGGTTTCAAGCCTGAGAAGGGGGGTCGTAAGCCAGCTCGTCTCATCGTGTTCCTCCGACCTG 6480
          TGCGTCCAACCAGAGAAGGGGGGGCCGCAAGCCAGCTCGCCTTATCGTATTCCAGATTG 6477
          TGCGTCCAACCAGAGAAGGGGGGGCCGCAAGCCAGCTCGCCTTATCGTATTCCAGATTG 6477
          ***** ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      GCGGTGCGCGTGTGCGAGAAGATGGCCCTGTACGACGTGATTAGCAAGCTCCCCCTGGCC 6540
          GGGGTTTGTGTGTGCGAGAAAATGGCCCTTTACGATGTGGTCTCCACCCTCCCTCAGGCC 6537
          GGGGTTTGTGTGTGCGAGAAAATGGCCCTTTACGATGTGGTCTCCACCCTCCCTCAGGCC 6537
          ** ** * ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      GTGATGGGAAGCTCCTACGGATTCCAATACTCACCAGGACAGCGGGTTGAATTCCTCGTG 6600
          GTGATGGGCTCTTCATACGGATTCCAATACTCTCCTGGACAGCGGGTCGAGTTCCTGGTG 6597
          GTGATGGGCTCTTCATACGGATTCCAATACTCTCCTGGACAGCGGGTCGAGTTCCTGGTG 6597
          ***** ** * ** * ** * ** * ** * ** * ** *

seven
two
eight      CAAGCGTGGAAGTCCAAGAAGACCCCGATGGGGTTCTCGTATGATACCCGCTGTTTTGAC 6660
          AATGCCTGGAAAGCGAAGAAATGCCCTATGGGCTTCGCATATGACACCCGCTGTTTTGAC 6657
          AATGCCTGGAAAGCGAAGAAATGCCCTATGGGCTTCGCATATGACACCCGCTGTTTTGAC 6657
          * ** ***** ** * ** * ** * ** * ** * ** *

seven
two
eight      TCCACAGTCACTGAGAGCGACATCCGTACGGAGGAGGCAATTTACCAATGTTGTGACTTG 6720
          TCAACGGTCACTGAGAATGACATCCGTGTTGAGGAGTCAATCTACCAATGTTGTGACTTG 6717
          TCAACGGTCACTGAGAATGACATCCGTGTTGAGGAGTCAATCTACCAATGTTGTGACTTG 6717
          ** ** ***** ** * ** * ** * ** * ** * ** *

seven
two
eight      GACCCCAAGCCCGCGTGCCATCAAGTCCCTCACTGAGAGGCTTTATGTTGGGGGCCCT 6780
          GCGCCGAAGCCAGACAGGCCATAAGGTCGCTCACAGAGCGGCTTTACATCGGGGGCCCC 6777
          GCGCCGAAGCCAGACAGGCCATAAGGTCGCTCACAGAGCGGCTTTACATCGGGGGCCCC 6777
          * ***** ** * ** * ** * ** * ** * ** *

seven
two
eight      CTACCAATTCAAGGGGGGAAACTGCGGCTACCGCAGGTGCCGCGAGCGGCGTACTG 6840
          CTGACTAATTCTAAGGGGCGAAGTGGGCTATCGCGGCTGCGCGGAGCGGCTGACTG 6837
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